PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 4 :
A62C 3/14 // F16K 1/18
F24F 13/10

A1

(11) International Publication Number: WO 86/ 05107

(43) International Publication Date:
12 September 1986 (12.09.86)

(21) International Application Number: PCT/FI85/00018

(22) International Filing Date: 1 March 1985 (01.03.85)

(71)(72) Applicant and Inventor: TAIMISTO, Eero [FI/FI]; Rautatienkatu 15, SF-47400 Kausala (FI).

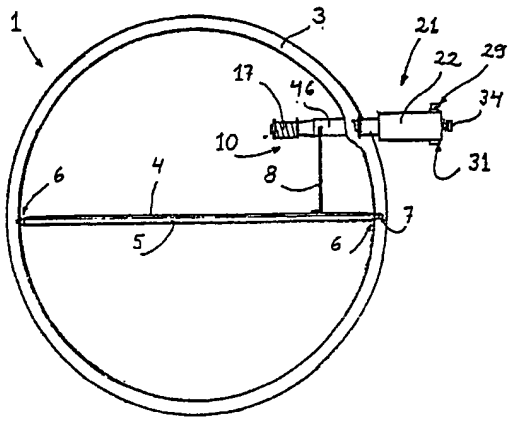
(74) Agent: INSINÖÖRITOIMISTO OLLI HEIKINHEIMO KY; PL 149, SF-00251 Helsinki (FI).

(81) Designated States: AT (European patent), BE (European patent), CH (European patent), DE (European patent), DK, FR (European patent), GB (European patent), JP, LU (European patent), NL (European patent), NO, SE (European patent), SU, US.

Published
With international search report.
In English translation (filed in Finnish).

(54) Title: APPARATUS FOR ADJUSTING AND RELEASING A FIRE DAMPER AND AN APPARATUS FOR OPERATING A FIRE DAMPER

(57) Abstract



An apparatus for adjusting and releasing a fire damper, and an apparatus for operating the fire damper. The adjusting and releasing apparatus is particularly suited for opening and closing a plate-type fire damper installed in a ventilation duct, and the operating apparatus (21) is suited to be employed as a remote manipulator for the fire damper. The fire damper comprises a housing (3) and a closing plate (4) located therein, which closing plate is used for closing the ventilation duct. The closing plate (4) is geared to the housing (3) by means of an axis (5). At both ends of the axis (5) there are attached locking springs (6). The adjusting and releasing apparatus comprises a catch (8) attached to the closing plate (4), which catch is a circle-segment shaped plate provided with notches (9) at the edge, and the adjusting and releasing member (10) of the closing plate (4) of the fire damper, which member is provided with an arrester moving within a sleeve-like frame. By aid of a notch provided in the catch (8), the arrester locks the closing plate (4) of the fire damper into desired position. In connection with the arrester there is provided a spring (17) manufactured of a metal which changes, its form within a certaining temperature range. By aid of the spring (17), the fire damper is closed automatically in a given temperature of the air flow. The operating apparatus (21) comprises a tubular shell (22) with a moving shaft fitted therein. The first end of the shaft is connected to the adjusting and releasing apparatus, and the other end is furnished with a manual press key (34). Inside the shell (22) there is located a piston connected to the shaft, and a cylinder chamber connected to a pressure control connection (29). Inside the shell (22) there can also be installed a coil which is coupled to an electric control connection (31).

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	GA	Gabon	MR	Mauritania
AU	Australia	GB	United Kingdom	MW	Malawi
BB	Barbados	HU	Hungary	NL	Netherlands
BE	Belgium	IT	Italy	NO	Norway
BG	Bulgaria	JP	Japan	RO	Romania
BR	Brazil	KP	Democratic People's Republic of Korea	SD	Sudan
CF	Central African Republic			SE	Sweden
CG	Congo	KR	Republic of Korea	SN	Senegal
CH	Switzerland	LI	Liechtenstein	SU	Soviet Union
CM	Cameroon	LK	Sri Lanka	TD	Chad
DE	Germany, Federal Republic of	LU	Luxembourg	TG	Togo
DK	Denmark	MC	Monaco	US	United States of America
FI	Finland	MG	Madagascar		
FR	France	ML	Mali		

APPARATUS FOR ADJUSTING AND RELEASING A FIRE DAMPER AND AN APPARATUS FOR OPERATING A FIRE DAMPER

The present invention relates to an apparatus for adjusting and releasing a fire damper, which fire damper can be installed in a ventilation duct or equivalent and comprises a housing and a closing plate or an equivalent member fitted therein whereby the duct can be closed. The said apparatus is particularly suited for opening and closing a plate-type fire damper or the like which is placed within a ventilation duct.

The invention also relates to an apparatus for operating a fire damper, the said fire damper comprising a housing, a duct leading through the housing and a plate, grate or equivalent closing member, which is installed within the duct and adjusted in its open-position, in which case the duct is left open, and which closing member is released to trigger off into its closed position by means of the operating apparatus, in which position the duct is tightly closed. The said operating apparatus is particularly well suited to be employed as a remote manipulator for a fire damper.

Fire dampers are used in ventilation ducts in order to shut separate parts of a building off for instance in the case of fire emergency. By aid of the fire dampers, the fire is prevented from spreading from the ignition point into other parts of the building via ventilation ducts.

In the prior art there are known fire dampers which are based on various lever and spring arrangements whereby a closing plate, grate or equivalent closing member is adjusted into a certain open position. Generally these are provided with a release device such as a heat-sensitive wax

fuse or wax cartridge, which releases the closing plate or equivalent to trigger off into closed position. The problem with these arrangements has been the disposable nature of the wax fuses, as well as the difficulties in readjusting the closing plate.

Generally speaking, the fitting of a remote control device into conventional fire dampers is difficult. The object of the present invention is to achieve a fire damper operating device which is simple, versatile and secure in operation. Moreover, the operating device is easily connectable to any type of fire damper where the closing member can be released by means of pressing or pulling a press key or the like located outside the fire damper housing.

The object of the present invention is to achieve an apparatus for adjusting and releasing a fire damper, which apparatus is, among other things, easily reset from outside the damper housing. The essential novel features of the apparatus for adjusting and releasing a fire damper according to the invention are enlisted in the appended patent claims 1-4.

The advantages pertaining to the fire damper adjusting and releasing apparatus of the invention include a structure which is simple and secure in operation. The operation can be easily tested from outside the ventilation duct and the fire damper by means of the adjusting lever of the closing plate and the press key of the arrester. The fact that the employed thermal release device is a spring which changes its form according to a change in the temperature ensures that the apparatus can be used continuously without maintenance. In addition to this, there can easily be installed an external operating device whereby the closing plate can, when desired, be released into closed position. Thus the fire damper can be connected to a remote manipulating system, control unit or equivalent.

The essential novel features of the apparatus for operating the fire damper of the invention are enlisted in the appended patent claims 5-10.

Apart from the advantages described above, other advantages of the operating apparatus of the invention are for instance its compact structure and the fact that when necessary, the apparatus can be operated either manually or by means of an electric and/or pressure impulse. Thus the same operating apparatus can be employed both in fire-risk facilities and in ordinary facilities irrespective of the type of control unit in question. The operating apparatus can be connected to a multitude of fire dampers with utterly different constructions. The only precondition is that the release operation can be effected by means of a slight mechanical movement.

In the following, the structure of the adjusting and releasing apparatus for a fire damper and the operating apparatus of the invention, as well as their advantages and operation, are described in more detail with reference to the appended drawings, where

Figure 1 is a side-view illustration of a fire damper installed in a ventilation duct and provided with the devices according to the invention;

Figure 2 shows the fire damper of figure 1 in cross-section along the line A-A;

Figure 3 shows the fire damper adjusting and releasing apparatus of figure 1 in partial cross-section and without the operating apparatus;

Figure 4 shows the apparatus of figure 3 in cross-section along the line B-B;

Figure 5 illustrates the fire damper operating apparatus of the invention in partial cross-section;

Figure 6 illustrates another operating apparatus of the

invention in partial cross-section; and

Figure 7 illustrates a joining member whereby the operating apparatus of the invention is attached to the fire damper.

According to figures 1-4, the fire damper 1 installed in a ventilation duct comprises the housing 3, the duct 2 leading through the housing 3, which duct is associated with the ventilation duct, and the closing plate 4, whereby the ventilation duct can be closed. The closing plate 4 is geared to the housing 3 by aid of the axis 5. At both ends of the axis 5, in between the axis and the housing, there are attached the locking springs 6. One end of the axis 5 penetrates the housing 3 and is formed to serve as the lever 7, which is employed for turning the closing plate 4. The closing plate 4 of the fire damper is, according to the drawing, provided with a catch 8, which in this case is a catch wheel. Most advantageously it forms a half-circle or equivalent circle segment, at the edge or the like whereof there is at least one notch 9 or recess, or several notches at desired intervals, as is apparent from figure 4.

In figure 3, the housing 3 of the fire damper 1 is provided with the adjusting and releasing member 10 of the closing plate 4. The said member comprises the movable arrester 11 proper, the stationary shell 14 thereof, the flange 15 or equivalent member which is connected to the arrester 11, and the bottom plate 16 which rests movably around the arrester against the shell 14, the spring 17 being located therebetween, as well as the press key 18 or equivalent attached to the external end of the housing 3 of the fire damper, and further the counterspring 20 fitted between the shoulder 19 of the shell 14 and a separate catch or press key 18 connected to the arrester 11.

The arrester 11 has the form of a straight, cylinder-like object provided with a slot or annular groove 13. It is fitted to move within the sleeve-like shell 14 attached to the housing 3 of the fire damper 1, in transversal position with respect to the catch wheel 8, at the distance of the radius r from the turning axis 5 of the closing plate 4.

The fire damper 1 functions as follows. The closing plate 4 of the fire damper is adjusted or released by turning the axis 5 by aid of the lever 7 exterior to the fire damper and by simultaneously pressing the press key 18 located at the end of the adjusting and releasing member 10. Now the groove 13 of the arrester 11 is shifted to meet the catch wheel 8. When the closing plate 4 is turned into the desired open position between C-D in figure 1, the press key 18 (34 in figure 1) is released, and the arrester 11 is returned into its normal rest position by aid of the counterspring 20. Now the locking member 12 of the arrester 11 is placed in the notch 9 located in the catch wheel , and the closing plate 4, is locked into the respective open position. The closing plate 4 of the fire damper 1 is closed by means of the locking springs 6 located on the axis 5 immediately when the position of the arrester 11 inside the arrester shell 14 holding the catch wheel 8 is axially changed, for instance by pressing the press key 18, so that the slot 13 of the arrester 11 is shifted to meet the catch wheel 8. The catch wheel 8 is released, the fire damper is triggered off and the locking springs 6 lock the closing plate 4 of the fire damper.

The axial power Fi (figure 3) directed to the arrester 11, and the closing of the closing plate 4 of the fire damper 1, can be effected, apart from manual operation as in the above description, i.e. by pressing the press key 18 and/or the arrester 11, also in many other ways. In the preferred

embodiment illustrated in figure 3, there is arranged a spring 17 at one end of the arrester 11. The said spring 17 is manufactured of a memory metal or a memory metal alloy, such as a copper-zinc-aluminium alloy. In order to effect a change in the form of the said metal or a member manufactured thereof - the said change in this case meaning that the spring 17 is lengthened between 20...40 % in the axial direction of the arrester 11 - there is needed a 10°...20°C change in the temperature, which change may fall anywhere between +150°C and -100°C. Consequently, the fire damper can be closed automatically on the basis of the temperature of the air flowing in the ventilation duct.

Figure 5 illustrates, in simplified form, a preferred embodiment of the fire damper operating apparatus of the invention. The operating apparatus 21 comprises the tubular shell 22 and the first and second end plates 26 and 27. On the axis of the shell 22 there is fitted a movable shaft 23 or equivalent elongate member, the first end whereof is connected to the releasing device of the closing member of the fire damper, such as the adjusting and releasing member 10 of the closing plate 4. Inside the shell 22, there is fitted the intermediary shell 24. To the shaft 23 there is attached, in transversal position, the plate 25 or equivalent member which is arranged inside the space 28 defined by the intermediary shell 24 and the first end plate 26. The said space 28 forms the cylinder chamber, and the said plate 25 serves as the piston to be moved within the cylinder chamber. The pressure control connection 29 is coupled to the cylinder chamber 28. At least the part 23a of the shaft 23 is made of a ferromagnetic material such as iron. Inside the intermediary shell 24 there can be fitted the coil 30 which can be coupled to the elctric control connection 31.

It is pointed out that the coil can be added to the operating apparatus whenever necessary. First the apparatus can be pressure-operated, but later it is easily provided with the intermediary shell 24 furnished with the coil 30 and coupled to the control unit by means of the electric control connection 31.

The above described operating apparatus of the invention is advantageously complemented so that in between the plate 25 serving as the piston and the intermediary shell 24 there is arranged a return spring 32 for the shaft 23. The spring can naturally be placed in any suitable location between the shell or a member immediately attached thereto, such as the intermediary shell or the end plate, and the movable shaft 23. In between the plate 25 and the end plate 26 there is advantageously fitted the bracket 33 which limits the returning motion of the spring 32 and by aid of which the dimension of the motion of the shaft 23 can be appropriately chosen. The said bracket 33 also defines the static volume of the cylinder chamber 28.

The shaft 23 can be axially continued, parallel to the shell 22, through the end plate 26. Thus the continuation of the shaft 23 can easily be furnished with a manual press key 34, as is illustrated by the dotted lines in figure 5.

The cylinder chamber 28 located between the intermediary shell 24 and the end plate 26 can also be formed by means of a separate auxiliary sleeve. This helps to make the chamber more compact and to improve the operation of the pressure cylinder. On the other hand, the intermediary shell 24 and the auxiliary sleeve can also be connected to form a uniform member, as will be described in more detail below.

Figure 6 is a detailed illustration of another fire damper operating apparatus which enables the fire damper to be operated from a remote control point either by aid of pressure or electric impulses, or even by aid of both. Seen from the top, the operating apparatus 21 advantageously comprises the tubular shell 22, the various control connections 29, 31 and 34, the end plates 26 and 27 as well as the joining sleeve 35. In the preferred embodiment of the illustration, the control connection 29 is designed for a pressurized medium such as pressure air, the connection 34 is a manual press key and the connection 29 is designed for electric control.

The joining sleeve 35 is attached, with respect to the manual press key, to the opposite end of the frame 22 so that it extends to the interior of the frame 22 and forms a sliding surface for the shaft 23. The shaft 23 is formed of three parts: the shaft 36 is attached in a stationary fashion, for instance by means of thereadings, to the core 37, at the other end whereof there is attached the shaft 38, respectively in a stationary fashion. At the end of the said shaft 38 there is located an extension which embodies the manual press key 34 proper. Thus the axial movement of the manual press key 34 is directly geared, via the operating apparatus, to the shaft 36. The returning of the moving parts 36, 37, 38 and 34 to the initial position is actuated by aid of the spring 32 arranged between the end plate 26 and the manual press key 34. The initial position of the shaft 36 and the manual press key 34 is defined by the sleeve 41 which is located freely on the shaft 38, anywhere between the end plate 26 and the disc-like plate 25.

The plate 25 is attached in between the shaft 38 and the core 37, and it serves as the piston. In between the end

plates 26 and 27 there is located the intermediary shell 39. The length of the intermediary shell corresponds to the interior of the shell 22 of the operating apparatus, and the first part thereof is formed as a coil housing, around which the coil 45 is wound, and the second part thereof is formed as an intermediary sleeve, which defines the cylinder chamber. At one end of the intermediary shell 39 there is located the extension 40, i.e. the cylinder chamber, whereinto the plate 25 is fitted. The outer circumference of the plate 25, which is advantageously polished in order to improve the tightening effect required of the piston, functions in cooperation with the inner surface of the extension 40 of the intermediary shell 39. According to figure 6, the pressure connection 29 opens into the extension 40 i.e. the space defined by the end plate 26, the plate 25, the intermediary shell 39 and the sleeve 41. When a pressurized medium is conducted into the connection 29, the excess pressure pushes the plate 25, the core 37 and the shaft 36 to the left, against the force of the spring 32. In this case the length of the working impact is limited by the control member 42 of the joining sleeve 35.

The axial extension 40 of the intermediary shell 39 is arranged in the first end of the intermediary shell, whereas the groove 44 located around the intermediary shell is arranged at the other, opposite end of the said intermediary shell. In the groove 44 there is fitted the coil 45. The ends of the coil 45 are connected, via the electric connection 31, to suitable power source, the voltage being advantageously 24 V. The intermediary shell 39 is made of an insulatable material such as plastic.

In order to create a closed magnetic circuit around the coil 45, so that the losses are diminished, the shell 22,

the core 37, the joining sleeve 35 and at least one of the end plates 27 are made of a ferromagnetic material such as iron. It is advantageous if also the other end plate 26 and the shaft 38 are made of the same material.

The electromagnetic effect of the current flowing in the coil 45 to the core 37 and thereby to the shaft 23 is intensified in the following manner. The diameter of the core 37, located axially in the middle of the shaft 23, is larger than the diameter of the shaft 36. The joining sleeve 35 and the core 37 are matched so that the other end of the joining sleeve 35, which end is located nearer to the core 37, is extended in order to form a control member 42 which is larger than the diameter of the shaft 23. Around the control member 42 there is located the shoulder 43, the lenght whereof is at least equal to the allowed length of the motion of the shaft 23. On the other hand, the corresponding end of the core 37 is furnished with a narrower part 37a, which fits tightly into the control member 42. The narrower part 37a is equally long or slightly longer than the shoulder 43. This construction ensures that the size of the air inlet between the core 37 and the joining sleeve 35 is maintained constant no matter in which working position the shaft 36 is, and even if the magnetic circuit losses are minimized.

When run by electricity, the operating apparatus of the fire damper of the invention functions as follows. When a sufficiently powerful electricity source is for a while connected, via the poles of the electric control connection 31, to the coil 45, the iron elements located within the shell 22 are shifted to the left, against the force of the spring 32, and simultaneously press the release device of the closing plate 4 of the fire damper by intermediation of the shaft 36, and thus release the closing plate 4 into

closed postion. With pressure control, the apparatus functions in a corresponding fashion.

Figure 7 illustrates the joining piece 46, whereby the operating apparatus 21 is attached to the fire damper 1. The joining piece 46 replaces the sleeve-like shell piece 14. The threaded part 47 of the joining piece 46 fits into the joining sleeve 35 of the operating apparatus 21, wherefore the respective pieces can be interconnected by means of screwing. As for the joining piece 46, its other end is pushed, as far as the collar 48, into the housing 3 of the fire damper 1. The slot 49 of the joining piece 46 corresponds to the slot or annular groove seen in the shell piece 14, in which groove the catch wheel 8 is free to rotate.

Typical of the construction of the invention is its versatility and its security in operation. It can be operated for example by Halon gas of by pressurized air. It may be arranged to function by means of a specific, heat-sensitive spring 17, or the spring can be replaced by a wax fuse and a conventional spring. Furthermore, electric impulses can be given in order to trigger off the closing member of the fire damper. At the same time it has been possible to maintain the simplest manner of operation, i.e. manual operation.

A particularly advantageous feature of the fire damper operating apparatus of the invention is its adaptability for electric drive. While the control unit surveys the conditions of various fire dampers, it is possible also to control the operational conditions of the whole system. By feeding a slight idle current to the coil of each operating apparatus, any defects in the system can be detected. If the current fed into a certain coil stops it is very likely

that the supply line is cut off. On the other hand, an unexpected rise in the current is a signal of either a short circuit of the closing of the fire damper, in which case it is anyway necessary to find out what the problem is. The closing of several fire dampers is carried out by sending the electric impulses successively for instance at the intervals of 1 ms.

It is pointed out that the number of the fire dampers connected to the operational system is by no means limited. The fire damper operating apparatus of the invention can naturally be used in connection to other types of fire damper adjusting and release devices than those specified above.

In the above specification, the adjusting and release apparatus of the invention has been described mainly with reference to one preferred embodiment thereof, but it is obvious that many modifications are possible within the scope of the present inventional idea. For example, the apparatus can be adapted for a fire damper which has a cross-sectional form other than a circle, and apart from closing plates, other types of closing devices can also be employed.

PATENT CLAIMS

1. An apparatus for adjusting and releasing a fire damper (1), which fire damper (1) can be installed in a ventilation duct or equivalent and comprises a housing (3) and a closing plate (4) or a similar member fitted therein, whereby the duct (2) can be closed, c h a r a c t e r i z e d in that the apparatus comprises a catch (8) which is attached to the closing plate (4) or equivalent of the fire damper and which is advantageously a circle-segment shaped plate, the arched edge or corresponding part whereof is provided with at least one notch (9) or recess; and an adjusting and releasing member (10) of the closing plate (4) of the fire damper, which member (10) has a sleeve-like shell (14), by aid of which the member (10) is attached to the housing (3) of the fire damper, and an arrester (11), which is fitted to move within the shell (14) in transversal position against the catch (8) along the area of the edge of the catch, so that the arrester (11) locks the closing plate (4) of the fire damper (1) into desired position by aid of the notch (9) located in the said catch wheel (8).

2. The apparatus of claim 1, c h a r a c t e r i z e d in that the sleeve-like shell (14) is provided with a shoulder (19) and that the arrester (11) is provided with a catch such as a press key (18), and that in between these two, there is fitted a counterspring (20) which holds the arrester (11) and simultaneously the closing plate (4) of the fire damper in desired position.

3. The apparatus of claim 2, c h a r a c t e r i z e d in that the other end of the arrester (11) is furnished with a spring (17) made of a generally known memory metal or metal alloy which changes its form within a desired

temperature range, which spring (17) is installed in between a flange (15) or equivalent connected to the arrester (11) and a bottom plate (16) which rests movably around the arrester (11) against the shell (14).

4. The apparatus of claim 2 or 3, c h a r a c t e r i z e d in that an external operating apparatus (21) is connected to the arrester (11) via a press key (10) or equivalent, which apparatus (21) sets the arrester (11), by employing a suitable power impact (Fi), in an axial motion which releases the locking of the closing plate (4) of the fire damper (1) and makes it close.

5. An apparatus for operating a fire damper, the said fire damper (1) comprising a housing (3), a duct (2) leading therethrough and a closing plate (4), grate or other corresponding closing member which is installed within the duct (2) and adjusted in its open position, in which case the duct is open, and which closing member is released, by employing the operating apparatus, to trigger off into closed position, in which position of the closing member the duct (2) is tightly closed, c h a r a c t e r i z e d in that the operating apparatus (21) comprises a tubular shell (22) and a first and second end plate (26, 27), on the axis of which shell (22) there is fitted a moving shaft (23) or equivalent means, the first end whereof is connected to the releasing device of the closing member, and that inside the shell (22) there is fitted an intermediary shell (24; 39), and that to the shaft (23) there is transversally attached a plate (25) or equivalent which is matched to fit in the space defined by the intermediary shell (24; 39) and the first end plate (26), the said space forming the cylinder chamber (28) and the plate (25) serving as the piston to be moved in the cylinder chamber, where the pressure control connection

(29) is connected to, and that at least part (23a; 37) of the shaft (23) is made of a ferromagnetic material, and that in the said intermediary shell (24; 39) there can be fitted a coil (30; 45), which is connectable to an electric control connection (31).

6. The operating apparatus of claim 5, c h a r a c t e r i z e d in that the cylinder chamber (28) is formed by means of a separate auxiliary sleeve.

7. The operating apparatus of claim 5, c h a r a c t e r i z e d in that the length of the intermediary shell (39) is equal to the interior lenght of the shell (22) of the operating apparatus and that the first part of the said intermediary shell is formed as a coil frame, around which the coil (45) can be wound, and that the second part therof is formed as an auxiliary sleeve which defines the cylinder chamber (28).

8. The operating apparatus of claim 5, c h a r a c t e r i z e d in that in between the shaft (23) and the shell (22) or a member immediately connected to the shell there is fitted a spring (32), by aid of which the shaft (23) can be returned into its initial position.

9. The operating apparatus of claims 5, 6, 7 or 8, c h a r a c t e r i z e d in that to the shell (22) of the operating apparatus there is connected a joining sleeve (35) which extends to the inside of the shell (22) and forms a sliding surface for the axial shaft (36).

10. The operating apparatus of claim 9, c h a r a c t e r i z e d in that axially in the center of the shaft (23) there is located the core (37) with a diameter larger than the diameter of the shaft (23; 36), and which core (37) and

joining sleeve (35) are made of a ferromagnetic material such as iron, and which joining sleeve (35) and core (37) are matched with each other so that the other end of the joining sleeve (35), located nearest to the core (37), is extended to form a control member (42) larger than the diameter of the shaft (23; 36), which control member (42) is provided with a shoulder (43) having a lengt at least equal to the length of the motion of the shaft (23), and that the corresponding end of the core (37) is provided with a narrower part (37a), which fits into the control member (42).

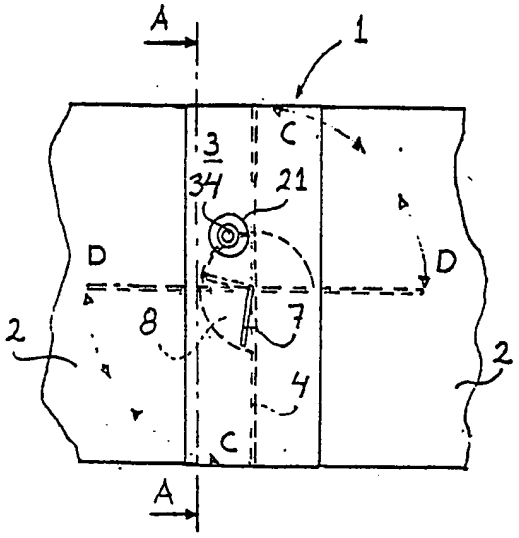


FIG. 1

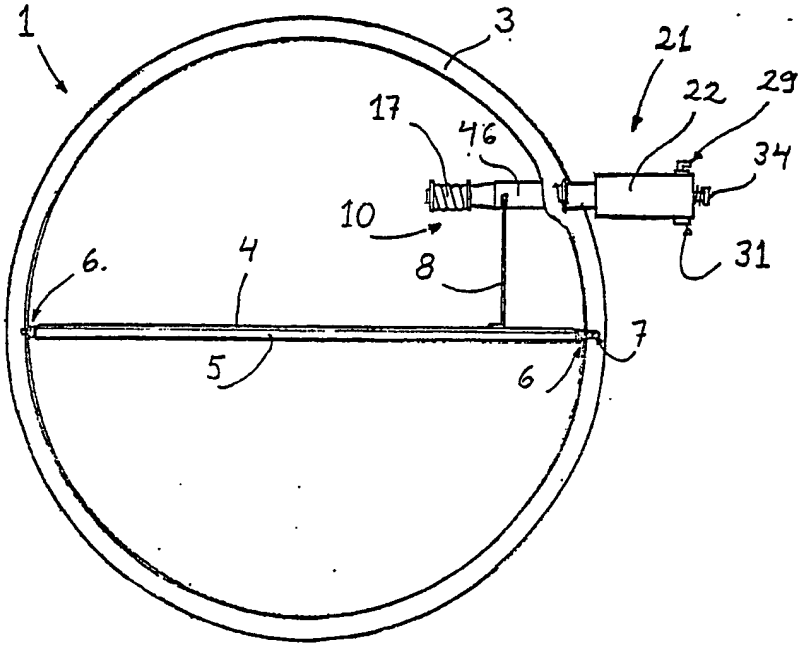


FIG. 2

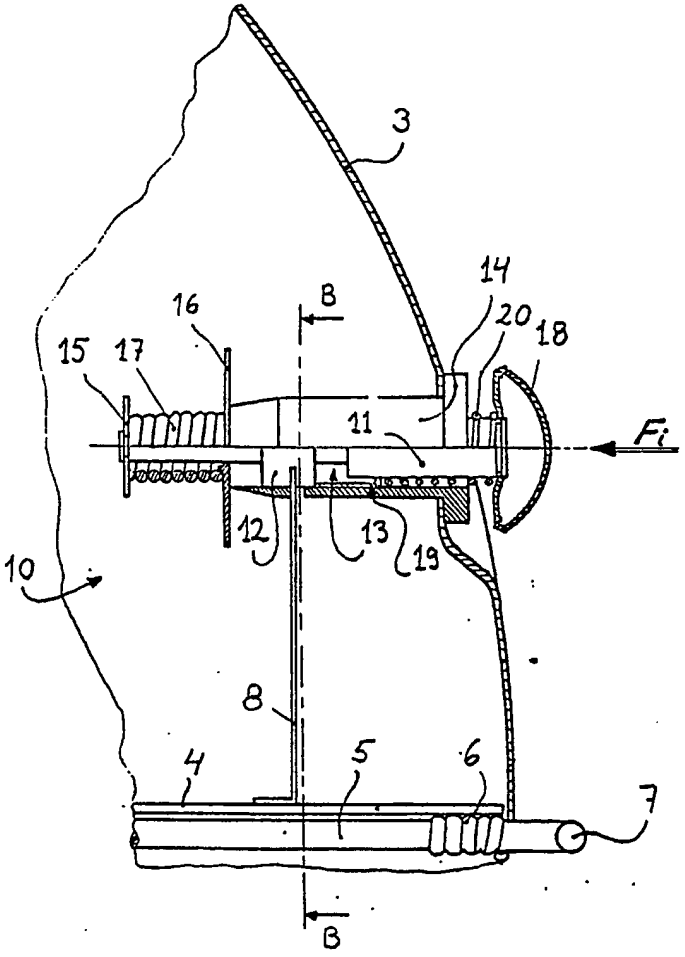


FIG. 3

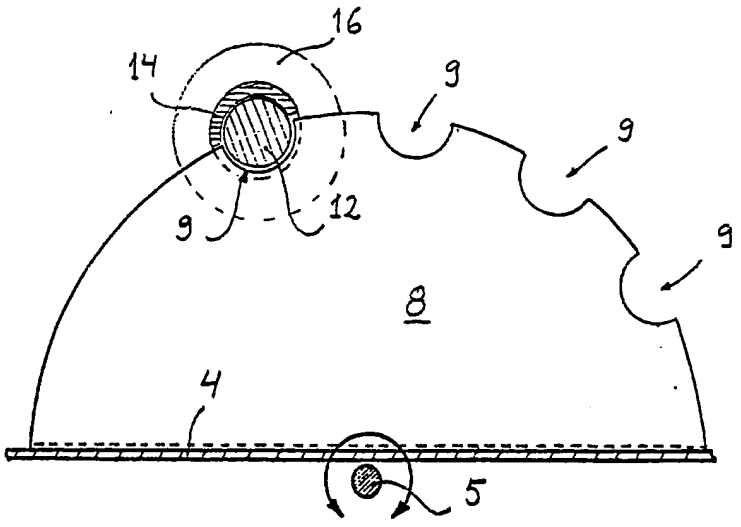


FIG. 4

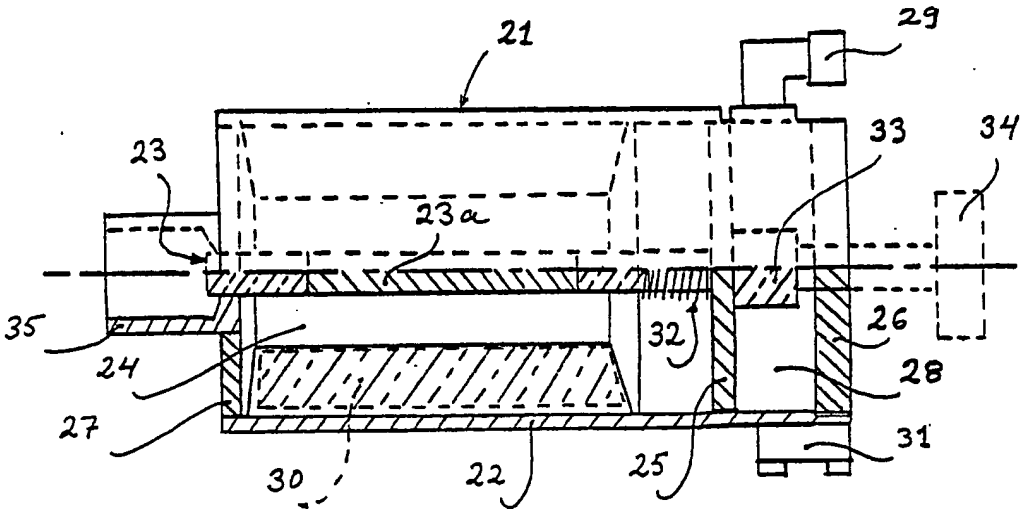


FIG. 5

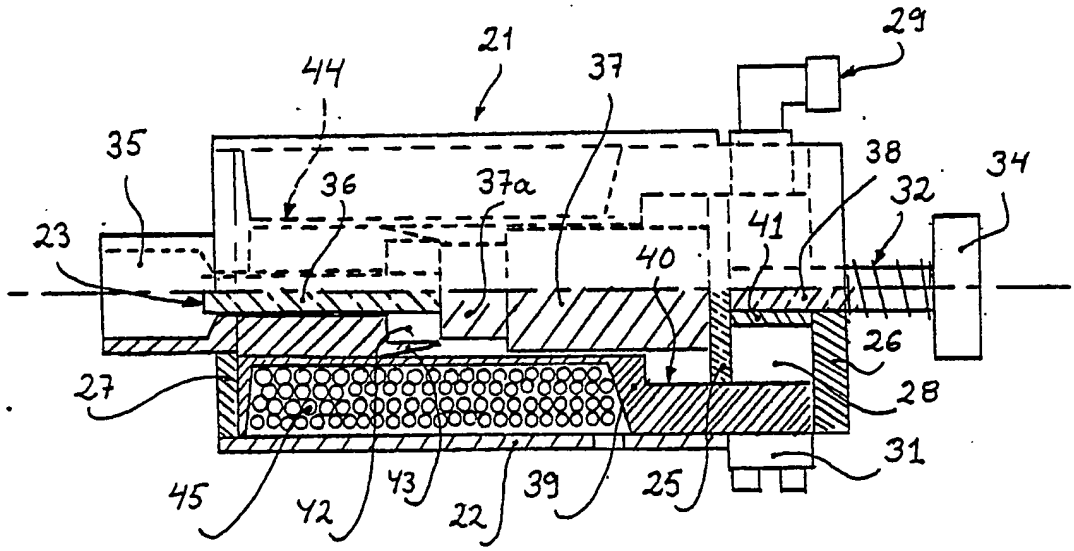


FIG. 6

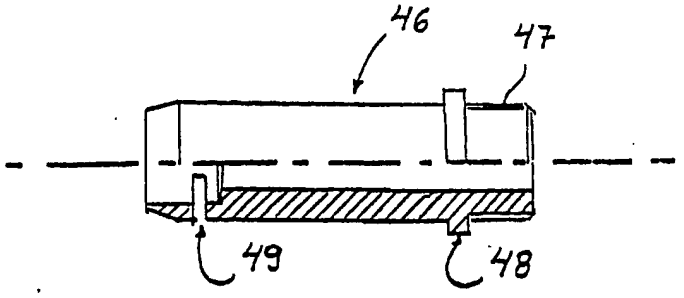


FIG. 7

INTERNATIONAL SEARCH REPORT

International Application No PCT/FI85/00018

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [6]

According to International Patent Classification (IPC) or to both National Classification and IPC 4

A 62 C 3/14 // F 16 K 1/18, F 24 F 13/10

II. FIELDS SEARCHED

Minimum Documentation Searched [7]

Classification System	Classification Symbols
IPC 4	A 62 C 3/14; F 16 K 1/18; F 24 F 13/10
US Cl	98:86; 126:287.5; 137:72, 74, 75

Documentation Searched other than Minimum Documentation to the Extent that such Documents are included in the Fields Searched [8]

SE, NO, DK, FI classes as above

III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

Category *	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No. [13]
Y	SE, B, 7802238-1 (HALTON OY) 2 September 1978 & CA, 1116921 FI, 54767	1, 2, 4
P	WO, A, 84/01906 (HALTON OY) 24 May 1984	1
P	WO, A, 84/01907 (HALTON OY) 24 May 1984	1
Y	DE, A, 2 609 449 (LTG LUFTTECHNISCHE GmbH) 8 September 1977	1, 2, 4
Y	NO, B, 148 700 (P B SIMBLE) 11 January 1982	1, 2, 4
Y	US, A, 1 125 416 (D S WATSON) 19 January 1915	1, 2, 4
Y	US, A, 1 352 255 (V L EMERSON) 7 September 1920 .../...	1, 2, 4

* Special categories of cited documents: [10]

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
1985-06-04	1985 -06- 07
International Searching Authority	**Signature of Authorized Officer**
Swedish Patent Office	Nils Andersson Nils Andersson

MJ

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)

Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No
Y	US, A, 2 242 738 (D E ALTON) 20 May 1941	1, 2, 4
Y	US, A, 4 060 096 (M G SCHADE) 29 November 1977	1, 2, 4

D. S. WATSON.

HEAT CONTROLLED DAMPER FOR HEATER PIPES.

APPLICATION FILED JUNE 10, 1914.

1,125,416. Patented Jan. 19, 1915.

Fig. 1.

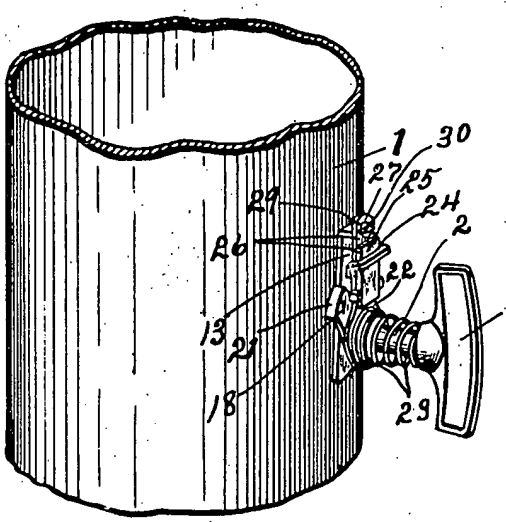


Fig. 5.

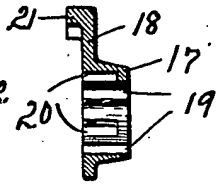


Fig. 4.

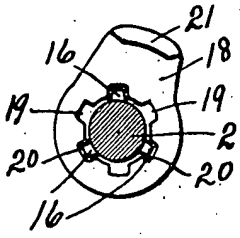


Fig. 3.

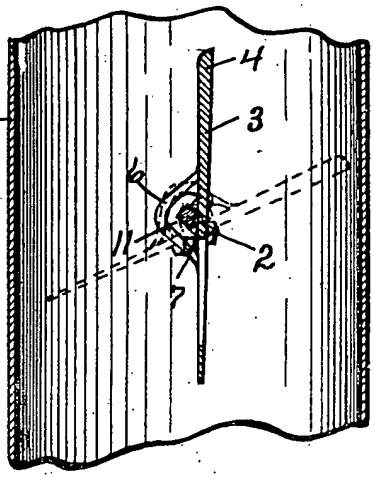


Fig. 2.

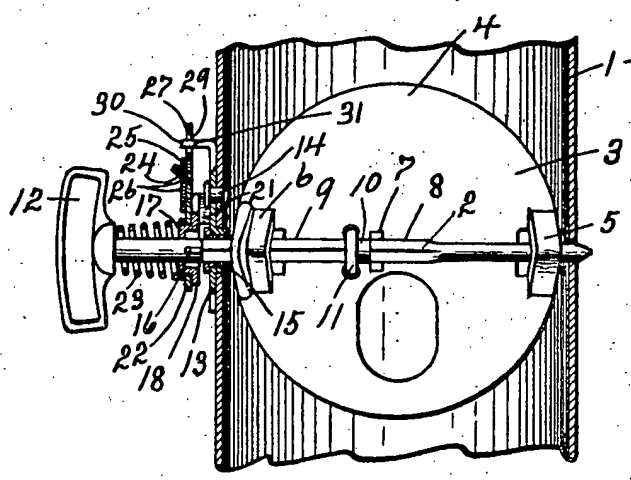


Fig. 10.

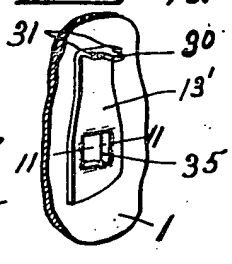


Fig. 6.

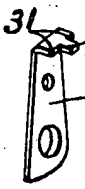


Fig. 11.

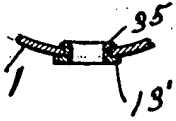


Fig. 7.

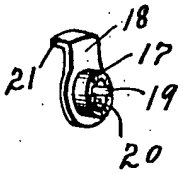


Fig. 8.

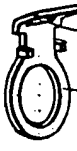
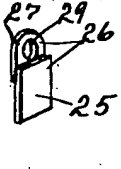


Fig. 9.



WITNESSES:

H. Thurst.

H. E. Chase

INVENTOR

D. S. Watson

BY Howard P. Denison

ATTORNEY.